Arguments for legal protection under SARA for bocaccio, canary, and yelloweye rockfish

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Introduction

This document is a formal submission to the Department of Fisheries and Oceans (DFO), which requested public consultation on the potential legal protection of bocaccio, canary and yellow rockfish under SARA legislation (DFO 2009a,b,c). We support legal protection of these species. Our arguments begin with three species-specific sections and conclude with a fourth section that provides general arguments applicable to all three species.

Species-Specific arguments

A. Bocaccio (*Sebastes paucispinis*)

COSEWIC designated bocaccio as threatened in 2002 (COSEWIC 2002) and again following reassessment in 2006 (DFO 2009a). Bocaccio is currently under consideration by the Federal Government for listing on Schedule 1 of SARA (DFO 2009a). Additional scientific information is now available supporting COSEWIC's designation and adding further impetus for legal listing:

1) Tolimieri and Levin (2005) provided rigorous evidence that bocaccio stocks have been severely impacted by overfishing, and that these effects are separable from climate effects.
2) It is known that bocaccio are vulnerable as bycatch. Between 1996 and 2006, 95.43 tons were caught as bycatch by the Pacific bottom trawl fleet (Driscoll *et al.* 2009). Importantly, although policy for managing bycatch has brought some reductions to reported landings (DFO 2009d), it also appears to have increased discards of bocaccio while at sea (Driscoll *et al.* 2009). Thus, the extent to which bycatch has been mitigated is unclear.
3) The IUCN has now designated bocaccio as globally endangered (IUCN 2007). This designation means that, without intervention, their probability of global extinction is much greater than one in ten (and even greater than 50%) over the next 100 years (e.g. Mooers *et al.* 2008).
4) Boccacio also score high on several new biodiversity indices (Magnuson-Ford *et al.* 2009). Bocacio is one of the top ten most evolutionary distinctive species of rockfish out of 112 species worldwide: its extinction would imply a disproportionately high loss of the total evolutionary history of the genus. Bocaccio also scores among the top 10 (of 61 species measured) in ecological distinctiveness, a multivariate measure of how different individual species are from the average ecology of the genus. Finally, bocaccio also score in the top ten (among 69 species measured) in intrinsic vulnerability. This is a compound index that combines nine morphological (e.g. size), life history (e.g. fecundity), and range size characteristics to produce an index of a species' ability to recover from overfishing (Cheung *et al.* 2005). A method that uses evolutionary distinctiveness to prioritize species that are both fished (now or in the very recent past) and that are vulnerable to overfishing based on intrinsic vulnerability places bocaccio in the top twelve rockfish species in most need of protection (Magnuson-Ford et al., 2009).

B. Canary rockfish (*S. pinninger*)

Canary rockfish were assessed as threatened in 2007 by COSEWIC (COSEWIC 2007) and are currently being considered for listing under SARA (DFO 2009b). Additional scientific information is now available supporting COSEWIC's designations and adding further impetus for legal listing:

1) Canary rockfish are a substantial component of bycatch. Between 1996 and 2006, 45.25 tons were caught as bycatch by the Pacific bottom trawl fleet (Driscoll *et al.* 2009).
2) Canary rockfish are above the median ecological distinctiveness (Magnusson-Ford *et al.*, 2009, Appendix A). Based on evolutionary distinctiveness (rank 18), intrinsic vulnerability to overfishing (rank 7), and fishing pressure, Magnuson-Ford *et al.* (2009: 1793) also scored

canary rockfish among "the top 12 species that should receive the most conservation attention."

C. Yelloweye rockfish (*S. ruberrimus*)

Yelloweye rockfish were assessed as being of special concern in 2008 by COSEWIC (COSEWIC 2008) and are currently being considered for listing under SARA (DFO 2009c). Additional scientific information is now available supporting COSEWIC's designations and adding further impetus for legal listing.

1) Yelloweye rockfish are a substantial component of bycatch. Between 1996 and 2006, 64.36 tons were caught as bycatch by the Pacific bottom trawl fleet (Driscoll *et al.* 2009).
2) Magnuson-Ford *et al.* (2009) found yelloweye to be the fourth most evolutionarily distinctive species (of all 112), the fourth most ecologically distinctive (of 61 measured) and the second most intrinsically vulnerable to overfishing (of 69 measured). As it is also affected by bycatch fishing, this makes this species of the very highest conservation concern (and so also places it in the top twelve in their analysis).

General arguments

The effectiveness of Rockfish Conservation Areas has yet to be determined.

Although a network of Rockfish Conservation Areas (RCAs) has been established in BC, RCAs cannot yet be considered a useful conservation tool. Ongoing research on RCA effectiveness is still in the very preliminary stages (J. Shurin, pers. comm.), but there is already evidence that RCAs have not always been placed in the best rockfish habitats (Marliave & Challenger 2009). More importantly in the short and medium term, enforcement resources are inadequate, making publically-available maps of RCAs guides to poachers seeking good places to fish. Given that adult bocaccio are semi-pelagic, spatial protection—even if enforced—may not necessarily be effective for this particular species.

Rockfish are predators that likely influence the structure of marine communities

There is growing evidence that marine predators play important roles in structuring ecological communities by affecting the behaviour and density of prey organisms that form these communities (Heithaus *et al.* 2008). Accordingly, Soulé and colleagues have argued that, beyond seeking the population viability of predators and other strong interactors, '(c)onservation plans should contain a requirement for ecologically effective population densities', which they defined as 'densities that maintain critical interactions and help ensure against ecosystem degradation' (Soulé *et al*. 2003:1239).

Rockfish are predators, and so we expect them to play important roles in structuring marine communities (Heithaus *et al.* 2008). Indeed, recent work by one of us (Frid & Marliave in review) provides evidence for trophic cascades and other multispecies interactions influenced by rockfish. We examined spatiotemporal variation in the relative abundance of lingcod (*Ophiodon elongatus*), subadult quillback and copper rockfish (*S. maliger* and *S. caurinus*, respectively) and two shrimp groups eaten by rockfish (*Pandalus* sp. and three smaller-bodied genera—*Eualus*, *Heptacarpus*, *Lebbeus*—aggregated). Path analyses identified both direct and indirect interactions among and within trophic levels such that removing these rockfish species would lead to complex changes in the broader ecosystem. While the specifics of natural history will vary according to rockfish species, there is no reason to expect that canary, bocaccio and yelloweye rockfish do not also play important roles in structuring marine communities along the lines of those that we demonstrated for copper and quillback rockfish. Such research is a priority, but it remains that conservation goals for predators like rockfish should go beyond mere demographic persistence (although that goal is an essential first step) and also incorporate concepts from predator-driven multispecies interactions and ecologically effective densities (Soulé *et al.* 2003; Heithaus *et al.*

2008). Such broader recovery objectives under SARA will be more likely to succeed the sooner rockfish are protected.

The socio-economic implications of listing *Sebastes* have been inadequately modelled

According to DFO's assessment of socio-economic implications of listing bocaccio (DFO 2009d) reduced target fishing of species that 'co-mingle' with bocaccio (and thus influence bocaccio bycatch) will 'affect profits and incomes in the fishing fleet.' Similarly, an economic analysis commissioned by DFO states that '… a decision to list Canary rockfish could have very significant social and economic impacts depending upon the specific management regime that is imposed subsequent to listing' (Fraser 2009:3).

Regarding the bocaccio analysis specifically, we first note that bocaccio were proposed for listing in 2002, but the current RIAS (Regulatory Impact Assessment) was not commissioned until 2008. Very valuable time seems to have been wasted. Second, the Executive Summary quotes the most rather than the least drastic scenario: the difference is large, with a direct fishery cost of about 3 million dollars a year under the low scenario versus 27 million dollars a year under the high scenario (a nine-fold difference). The introduction then states that "There are a number of exempting mechanisms that can be employed under SARA to allow for the harvest of species listed as endangered or threatened … That being said, SARA prohibitions have the potential to curtail fisheries and initiate a series of protections on habitat which can have significant consequences for fish harvesting and processing operations." Given that the document deals with costs *and* benefits, it seems remiss that the benefits of protection to Canadian society, to the fish, and to the fishery are not mentioned at this important point in the document. This point is critical because legal protection will aid the recovery of bocaccio and of other species found in the same ecological communities, enhancing the potential for future fishing and long-term ecosystem services (see Costanza *et al.* 1997).

While we welcome the acknowledgement of non-use values in the bocaccio document (pointing out that it may be in the tens of millions of dollars annually, which is relevant in light of the direct costs of the low impact scenario cited above), such an evaluation is missing from the DFO's analyses of canary rockfish; indeed, the document (DFO 2009b) states that "It seems unlikely given the limited public awareness of the species and the range of similar species that substantive existence, option or bequest values would be specifically associated with Canary rockfish." If the difference in non-use value is partly one of public awareness, then the monetary non-use value of this fish is extremely sensitive to public education. For instance, a one-off million-dollar awareness campaign by government agencies could reap large long-term non-use value, perhaps in the range of millions of dollars a year (c.f. Rudd 2009). The dismissal cited above is inconsistent with the bocaccio analysis and hard to defend.

We return to the bocaccio analysis for a general point about time scale. Although the draft socio-economic impact analysis for bocaccio is transparent about the sparse data that were available for making projections, the authors choose biologically inappropriate time-scales for scrutiny. For slowly maturing, long-lived species like rockfish, little meaningful ecological recovery can be expected on the forty-year time-frame chosen. This shortcoming is analogous to modelling the costs and benefits of a new bridge on a shorter time frame than the expected lifetime of that bridge (e.g. on a one-year scale, before the bridge was even completed). Modelling scenarios on a longer time-frame leads to greater uncertainties, yet projections spanning much more than 40 years are needed to understand the costs and benefits of legally protecting rockfish.

Our final point is that attempts to manage the socioeconomic issues of fisheries will fail in the long-term if these attempts compromise the ecological integrity of ecosystems. Thus, neoclassical economics models (i.e., those found in the DFO reports) for assessing the costs and benefits of protecting rockfish must be augmented—and preferably replaced—with models from ecological economics, as exemplified by Costanza and colleagues (Costanza *et al.* 1997) and Dasgupta

(2010). The infamous case of the cod fishery on the East Coast may be a broad but relevant guide; old-fashioned thinking was one of the reasons why the world's most productive cod fishery, worth billions of dollars annually, collapsed to the point where COSEWIC has deemed some populations at risk of extinction (Hutchings *et al.* 1997). We must not waste our current opportunity to protect rockfish and reap all the long-term benefits inherent to an economic framework that values natural capital and ecosystem services (Costanza *et al.* 1997; Dasgupta 2010).

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